

CLAIMS

1. A dry mixture of an aggregate material prepared by the steps of:
mixing an aggregate granular material, one or more kind of a water-soluble binder, and water, to make a mixture;
evaporating the moisture within said mixture during said mixing step such that said mixture is dried and has single-grain structures; and
wherein additional water is added to said dry mixture to form a molding material for molding a mold with said dry mixture.
2. A dry mixture of an aggregate material as recited in claim 1, wherein said mixture contains from 0.1 wt% to 5.0 wt% of said water-soluble binder based on the total weight of said aggregate granular material.
3. A dry mixture of an aggregate material as recited in claim 1 or 2, wherein said water-soluble binder is soluble by the water at an ambient temperature.
4. A dry mixture of an aggregate material as recited in any of claims 1, 2, and 3, wherein said water-soluble binder is at least either a polyvinyl alcohol or its derivative; or at least either a starch or its derivative; or both.
5. A dry mixture of an aggregate material as recited in any of claims 1, 2, and 3, wherein said dry mixture further includes a lubricant.
6. A dry mixture of an aggregate material prepared by the steps of:
mixing an aggregate granular material, a water-soluble binder, a cross-linker that is capable of cross-linking with said water-soluble binder, and water;
evaporating the moisture within said mixture during said mixing step to prevent the cross-linking reaction between said water-soluble binder and said cross-linker such that said mixture is dried and has single-grain structures; and

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wherein additional water is added to said dry mixture to form a molding material for molding a mold with said dry mixture.

7. A dry mixture of an aggregate material as recited in claim 6, wherein said mixture contains from 0.1 wt% to 5.0 wt% of said water-soluble binder based on the total weight of said aggregate granular material.
8. A dry mixture of an aggregate material as recited in claim 6 or 7, wherein said water-soluble binder is soluble by the water at the ambient temperature.
9. A dry mixture of an aggregate material as recited in any of claims 6, 7, and 8, wherein said water-soluble binder is at least either a polyvinyl alcohol or its derivative, or at least either a starch or its derivative, or both.
10. A dry mixture of an aggregate material as recited in any of claims 6-9, wherein said cross-linker is selected from the group consisting of an aldehyde, an N-methylol compound, a carboxylic compound, an epoxy compound, an activated vinyl compound, an diisocyanate, and a complexing agent.
11. A dry mixture of an aggregate material as recited in claim 10, wherein said aldehyde is a glyoxal.
12. A dry mixture of an aggregate material as recited in claim 10, wherein said N-methylol compound is selected from the group consisting of an N-methylol urea, and an N-methylol melamine.
13. A dry mixture of an aggregate material as recited in claim 10, wherein said carboxylic compound is selected from the group consisting of an oxalic acid, a maleic acid, a succinic acid, a butane-tetracarboxylic acid, and a methyl vinyl ether-maleic acid copolymer.
14. A dry mixture of an aggregate material as recited in any of claims 6-13, wherein said dry mixture further includes a lubricant.

15. A molding process for molding a mold, said process comprising the steps of:

freezing said dry mixture with said additional water as recited in any of claims 1-4 such that said mixture has single-grain structures;

charging said frozen mixture into a molding space;

evaporating the moisture within said charged mixture to cure said charged mixture to mold a mold with said cured mixture; and

removing said molded mold from said molding space.

16. A molding process for molding a mold, said process comprising the steps of:

freezing said dry mixture with said additional water as recited in any of claims 1-4 such that said mixture has single-grain structures;

adding a lubricant to said frozen mixture;

charging said frozen mixture with said lubricant into a molding space;

evaporating the moisture within said charged mixture to cure said charged mixture to mold a mold with said cured mixture; and

removing said molded mold from said molding space.

17. A molding process as recited in claim 15 or 16, said process further comprising the steps of:

before said step of charging said frozen mixture into said molding space, temporarily storing in a vessel a quantity of said frozen mixture that is greater or equal to the quantity of said frozen mixture to be charged into said molding space; and

stirring said mixture within said vessel in a condition in which the frozen moisture within said mixture cannot be thawed, to maintain said single-grain structures of the mixture to be charged into said molding space.

18. A molding process for molding a mold, said process comprising the steps of:

stirring said dry mixture with said additional water as recited in any of claims 1-4 to cause it to foam;

charging said foamed mixture into a molding space;

evaporating the moisture within said charged mixture to cure said charged mixture to mold a mold with said cured mixture; and

removing said molded mold from said molding space.

19. A molding process for molding a mold, said process comprising the steps of:

freezing said dry mixture with said additional water as recited in any of claims 6-14 such that said mixture has single-grain structures;

charging said frozen mixture into a molding space;

evaporating the moisture within said charged mixture to cure said charged mixture to mold a mold with said cured mixture;

causing a cross-linking reaction between said water-soluble binder and said cross-linker; and

removing said molded mold from said molding space.

20. A molding process for molding a mold, said process comprising the steps of:

freezing said dry mixture with said additional water as recited in any of claims 6-14 such that said mixture has single-grain structures;

charging said frozen mixture into a molding space;

evaporating the moisture within said charged mixture to cure said charged mixture to mold a mold with said cured mixture;

removing said molded mold from said molding space; and

causing a cross-linking reaction between said water-soluble binder and said cross-linker.

21. A molding process for molding a mold, said process comprising the steps of:

freezing said mixture with said additional water as recited in any of claims 6-13 such that said mixture has single-grain structures;

adding a lubricant to said mixture;
charging said frozen mixture with said lubricant into a molding space;
evaporating the moisture within said charged mixture to cure said
charged mixture to mold a mold with said cured mixture;
causing a cross-linking reaction between said water-soluble binder and
said cross-linker; and
removing said molded mold from said molding space.

22. A molding process for molding a mold, said process comprising the steps
of:

freezing said mixture with said additional water as recited in any of claims
6-13 such that said mixture has single-grain structures;
adding a lubricant to said mixture;
charging said frozen mixture with said lubricant into a molding space;
evaporating the moisture within said charged mixture to cure said
charged mixture to mold a mold with said cured mixture;
removing said molded mold from said molding space; and
causing a cross-linking reaction between said water-soluble binder and
said cross-linker.

23. A molding process as recited in any of claims 19-22, said process further
comprising the steps of:

before said step of charging said frozen mixture into said molding space,
temporarily storing in a vessel a quantity of said frozen mixture that is greater
than or equal to the quantity of said frozen mixture to be charged into said
molding space; and

stirring said mixture within said vessel in a condition in which the frozen
moisture within said mixture cannot be thawed, to maintain said single-grain
structures of the mixture to be charged into said molding space.

24. A molding process for molding a mold, said process comprising the steps
of:

stirring said mixture with said additional water as recited in any of claims 6-13 to cause it to foam;

charging said foamed mixture into a molding space;

evaporating the moisture within said charged mixture to cure said charged mixture to mold a mold with said cured mixture;

causing a cross-linking reaction between said water-soluble binder and said cross-linker; and

removing said molded mold from said molding space.

25. A molding process for molding a mold, said process comprising the steps of:

stirring said mixture with said additional water as recited in any of claims 6-13 to cause it to foam;

charging said foamed mixture into a molding space;

evaporating the moisture within said charged mixture to cure said charged mixture to mold a mold with said cured mixture;

removing said molded mold from said molding space; and

causing a cross-linking reaction between said water-soluble binder and said cross-linker.

26. A core mold for casting an aluminum alloy, said core mold being molded by said molding process as recited any of claims 19-25.

27. A core mold is molded by said molding process as recited by any of claims 19-25, wherein the surface of said core mold is coated with a mold wash.